but be highly useful, as they may be depended on; the interior surveys of those parts having since proved that no erroneous intersections had been made in those operations.

The Bakerian *Lecture. Experiments and Calculations relative to physical Optics. By* Thomas Young, *M.D. F.R.S.* Read November 24, 1803. [*Phil. Trans.* 1804, *p.* 1.]

It consists of six sections, the first of which is intended to convey an experimental demonstration of the general law of the interference of light. This demonstration rests on two experiments, the results of which are brought in proof, that fringes of colours, and even the crested fringes described by Grimaldi, are produced by the interference of two portions of light. These results are, that if one of the two edges of a shadow produced by a narrow opake body be intercepted by a screen at a small distance from that body, the opposite edge will no longer exhibit the fringed appearance which it had in common with the former edge, when the latter was not intercepted.

Under the second head we have a comparison of measures of the intervals of disappearance of light when refracted between two edges of knives, or intercepted by a hair or a thin wire. The experiments, which were partly suggested by some observations of Sir Isaac Newton, are here collected in tables: and the author states, as a general inference, that if we thus examine the dimensions of the fringes under different circumstances, we may calculate the differences of the lengths of the paths of the portions of light which have been proved to be concerned in producing those fringes; and we shall find, that where the lengths are equal, the light always remains white; but that where either the brightest light, or the light of any given colour, disappears and reappears a first, a second, or a third time, the differences of the paths of the two portions are nearly in an arithmetical progression.

In the third section, these principles are applied to explain the repetition of colours sometimes observed within the common rainbow, particularly those described in the Philosophical Transactions by Dr. Langwith and Mr. Daval. The train of reasoning here adduced would lose too much of its evidence by being abridged.

The fourth section is entitled, "Argumentative inference respecting the Nature of Light." Here we meet with something of a controversial nature, in which those who have adopted theories different from that which our author is desirous to establish, are called upon to explain his experiments according to their principles. What appears to him to operate chiefly against the advocates for the projectile hypothesis of light, is, that light moves more slowly in a denser than in a rarer medium, and that hence refraction is not the effect of an attractive force directed to a denser medium.

The fifth section treats of the colours of natural bodies. The nature of the light transmitted by various bodies is here described, but

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more particularly that which passes through blue glass. This, we are told, may be separated by the prism into seven distinct portions, nearly equal in magnitude: the two first are red, the third yellowish green, the fourth green, the fifth blue, the sixth bluish violet, and the seventh violet. This division, it seems, agrees perfectly with that of the light reflected by a plate of air $\frac{1}{16,480}$th part of an inch in thickness: and hence we may infer the extreme minuteness of the particles of light.

The sixth and last section describes an experiment on certain dark rays, which were first noticed by Ritter, and relates to the existence of solar rays accompanying light, but cognizable only by their chemical effects. This fact our author has confirmed by observing the effect of the reflection of these invisible solar rays from a thin plate of air capable of producing the well-known rings of colours. This image he threw on paper dipped in a solution of nitrate of silver, and in less than an hour he distinctly perceived portions of three dark rings, nearly of the same dimensions, but manifestly different from the coloured rings. This seems to coincide with Dr. Herschel's late discovery of rays of invisible heat; but our author doubts whether we are yet possessed of thermometers of sufficient delicacy to place implicit confidence in the experiments hitherto made on these rays by means of that instrument.

Continuation of an Account of a peculiar Arrangement in the Arteries distributed on the Muscles of slow-moving Animals, &c. In a Letter from Mr. Anthony Carlisle *to* John Symmons, *Esq. F.R.S.* Read December 8, 1803. [*Phil. Trans.* 1804, *p.* 17.]

Since the communication of his former paper on that subject, the author has collected further illustrations respecting the connexion between the disposition of the blood-vessels and the actions of the muscles. His first observations relate to the spermatic and intercostal arteries, and those of the diaphragm in men; which, he finds, are distributed in a different manner from those of the ordinary muscles. Compared with the distribution of the coronary arteries, it is found that the latter are much more subdivided or arborescent than any other set, and that accordingly these supply the heart,—a muscle whose actions we know are more rapid than those of any other part of the muscular system.

It is hence inferred, that any impediment to the accustomed course of the blood, flowing through muscles, induces a corresponding diminution in their power of action; and that wherever we find cylindrical arteries emitting few lateral branches, we may conclude that they appertain to muscles of slow but in general of long-continued motion. Of this, instances are given in the human eye, the swimming-bladder of fishes, the intestinum ileum of the Cavia Aguti, and various animals of the amphibious class. The better to illustrate his observations, the author has added figures of the swimming-bladder of the tench, and of the ileum of the Aguti.